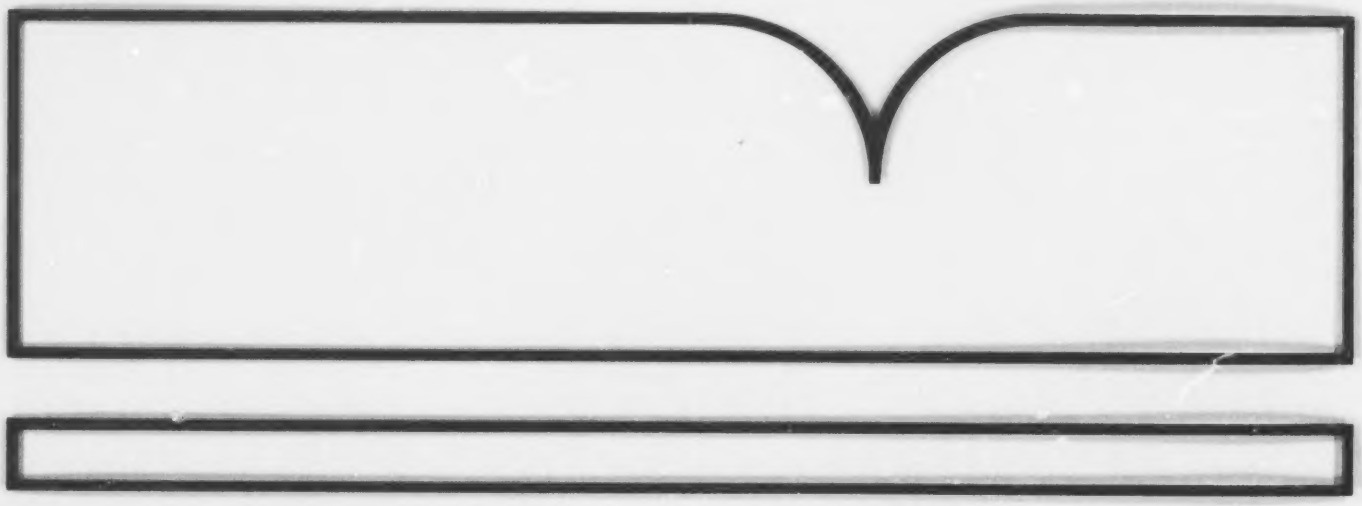
PB88-248968

# Report of the Director of the Science Advisory Board for Fiscal Year 1987

(U.S.) Environmental Protection Agency
Washington, DC

Dec 87



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This is the second Annual Report of the Director of the Science Advisory Board. The Board maintained a very active program of independent reviews of EPA research programs and the scientific bases of number of the Agency's major regulatory and policy decisions. These activities as well as others were designed to increase the scientific community's ability to present high quality and timely advice to policy makers and the Congress, and to promote technical consensus as a means of achieving consensus on environmental policies.

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United States
Environmental Protection
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Office of the Administrator
Science Advisory Board
Washington, D.C. 20460

SAB-88-007
December, 1987

# EPA Report of the Director of the Science Advisory Board for Fiscal Year 1987

# SCIENCE ADVISORY BOARD

REPRODUCED BY
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U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D C 20460

December 10, 1987

OFFICE OF
THE ADMINISTRATOR

NOTE TO THE READER:

This is the second Annual Report of the Director of the Science Advisory Board of the U. S. Environmental Protection Agency. This report presents the activities and accomplishments of the Board for Fiscal Year 1987 (October 1, 1986 to September 30, 1987). During this year the Board maintained a very active program of independent reviews of EPA research programs and the scientific bases of a number of the Agency's major regulatory and policy decisions. In addition, it began to implement the Congressional mandate in the Amendments to the Safe Drinking Water Act for review of the technical bases of drinking water standards. These and other activities were designed to increase the scientific community's ability to present high quality and timely advice to policy makers and the Congress, and to promote technical consensus as a means of achieving consensus on environmental policies. Finally, and in recognition of the increased public awareness and desire for information on the Science Advisory Board, operating procedures were developed for publication in the Federal Register.

Like last year's report, it is my hope that the report for Fiscal Year 1987 will improve public understanding not only of the Board's contributions but also of an array of scientific issues and their role in the decision making process.

Terry F. Yosie, Director
Science Advisory Board

SAB-88-007

# Report of the Director of the Science Advisory Board

## For Fiscal Year 1987

Science Advisory Board

U. S. Environmental Protection Agency

December 1987

U. S. ENVIRONMENTAL PROTECTION AGENCY

NOTICE

This report has been written as a part of the activities of the Science Advisory Board, a public advisory group providing extramural scientific information and advice to the Administrator and other officials of the Environmental Protection Agency. The Board is structured to provide a balanced expert assessment of scientific matters related to problems facing the Agency. This report has not been reviewed for approval by the Agency and, hence, the contents of this report do not necessarily represent the views and policies of the Environmental Protection Agency, nor of other agencies in the Executive Branch of the Federal government, nor does mention of trade names or commercial products constitute endorsement of recommendation for use.

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# I. Summary of the Science Advisory Board's Fiscal Year 1987 Activities

This report presents the activities and accomplishments of the Science Advisory Board for Fiscal Year (FY) 1987 (October 1, 1986 to September 30, 1987). During this year the Board maintained a very active program of independent reviews of EPA research programs and the scientific bases of a number of the Agency's major regulatory and policy decisions. In addition, it began to implement the Congressional mandate in the Amendments to the Safe Drinking Water Act for review of the technical bases of drinking water standards. All of the above activities were designed to increase the scientific community's ability to present high quality and timely advice to policy makers and the Congress and to promote technical consensus as a means of achieving consensus on environmental policies. Like last year's report, the report for Fiscal Year 1987 is intended to improve public understanding not only of the Board's contributions but also of an array of scientific issues and their role in the decision making process.

While no single form of peer review can address the range of scientific issues encountered by regulatory agencies, the capability of the Science Advisory Board has evolved to enable it to conduct a wide ranging set of scientific evaluations. These include reviews of:

- Research programs
- The technical bases of regulations and standards
- Policy statements or guidance
- Methodology development
- Advisory documents
- Specific scientific proposals, studies or surveys
- Presidential research budget proposals
- Reviews requested by other Federal agencies
- EPA reports to Congress
- and SAB initiatives

To conduct these reviews the Board had to maintain or recruit scientific expertise from a number of scientific disciplines. In addition, it had to assist in defining the relevant scientific and technical issues under discussion; exhibit a familiarity with existing legislative requirements and EPA policies, procedures and regulations; understand and communicate the latest developments and advances generated by various research disciplines; and integrate the skills of advisory committee members and consultants to prepare high quality and timely scientific reports for the EPA Administrator and Congress.

Several major characteristics of SAB reviews during the past year include the following:

- o Implementation of Amendments to the Safe Drinking Water Act. Through the establishment of a Drinking Water Subcommittee of the Environmental Health Committee, the Board conducted 17 reviews of drinking water issues. They included evaluations of: drinking water criteria documents and other assessments that supported rulemaking activities; research programs; health advisories; and a draft report to Congress comparing the health risks associated with alternative treatment technologies.

- o Greater emphasis upon ecological issues. The Board's focus included ongoing EPA research programs such as the water quality based approach, biotechnology, and the development of methodologies for ecological risk assessment. The formation of the Long-Range Ecological Research Needs Subcommittee pointed to the broader need for EPA to develop a longer-range research program and agenda.

- o Evaluating and recommending modifications of the Superfund Hazard Ranking System. In its first review of a Superfund program issue, the Board focused on three major scientific issues: exposure, toxicity and large volume wastes. A major theme of the review is the need to more closely relate the ranking received by a site to the risk posed by the site.

- o For the first time in its history, Board responded to a joint request from EPA and the Office of Management and Budget. Both agencies asked the SAB to identify research needs associated with health and environmental effects of stratospheric ozone depletion.

- o A salient characteristic of the past year was EPA's responses to SAB reports. In his memorandum of June 25, 1985 to senior managers, Administrator Lee Thomas directed that any office that received a SAB report should respond in writing to the Board's advice, indicating agreement or disagreement and the reasons for such action. In FY 87, EPA offices uniformly complied with this directive, oftentimes providing verbal or written feedback before the completion of the SAB's review, in addition to formal responses following the completion of reviews.

The SAB carried out 77 scientific reviews during FY 87 (including the Clean Air Scientific Advisory Committee). Some of these reviews were initiated during FY '86, while others that began this past year will carry over in FY 88. By category of activity, the following issues constituted the SAB's agenda for FY 87:

Research Programs

- o Development of Research Strategies
  (Five issues: Sources, Transport and Fate: Exposure Assessment; Health Effects; Ecological Effects; and Risk Reduction)

- o Land Disposal

- o Drinking Water Disinfectants and Their By-Products
- o Indoor Air Quality
- o Engineering Research Program on Indoor Air Quality: Radon Reduction, Research and Development, Program Description and Plans
- o Research Needs for Lead and Ozone (Two issues) (Clean Air Scientific Advisory Committee)
- o Biotechnology
- o Waste Minimization
- o Municipal Waste Combustion
- o Integrated Air Cancer Project
- o Ecological Risk Assessment
- o Radon Mitigation
- o Extrapolation Modeling
- o Water Quality Based Approach
- o Scientific and Technological Achievement Awards

Technical Bases of Regulations and Standards

- o Draft Screening Analysis of Mining Wastes
- o Underground Storage Tank Release Simulation Model
- o Draft Health Assessment Documents for Beryllium; Cis- and Trans- Dichloroethylene; 1,2 Dichloropropane; Polychlorinated Biphenals; Polychlorinated Dibenzofurans; Tetrachloroethylene; and Trichloroethylene (8 issues)
- o Drinking Water Criteria Documents for Meta-Ortho-Para Dichlorobenzene; Monochlorobenzene; Nitrate/Nitrite; Xylene; Man-made Radionuclide Occurrence; Radium; Radon; and Uranium (10 issues)
- o Drinking Water Assessment of Radionuclides
- o Proposed Drinking Water Rules for Filtration and Coliforms (2 issues)
- o Assessment of the Risks of Stratospheric Modification
- o Evaluation of Landfilling and Land Application as Alternatives to Ocean Disposal of Sewage Sludges

- o Assessment of the Separate Treatment of Sewage Sludges and Dredged Materials Under EPA's Ocean Dumping Regulations

- o Sewage Sludge Risk Assessment Methodologies to Support the Development of National Criteria for Sludge Management

- o Scientific Issues Related to Municipal Waste Combustion

- o Municipal Waste Combustion Ash Assessment

- o Air Quality Criteria for Ozone and Other Photochemical Oxidants (Clean Air Scientific Advisory Committee)

- o Addendum to the Air Quality Criteria for Particulate Matter and Sulfur Oxides (Clean Air Scientific Advisory Committee)

- o Addendum to the OAQPS Staff Paper for Particulate Matter (Clean Air Scientific Advisory Committee)

- o Addendum to the OAQPS Staff Paper for Sulfur Oxides (Clean Air Scientific Advisory Committee)

Policy Statements or Guidance

- o Review of Draft Guidance for the Establishment of Alternate Concentration Limits for RCRA Facilities

- o Superfund Hazard Ranking System

Methodology Development

- o Methodology for the Assessment of Health Risks Associated with Multiple Pathway Exposure to Municipal Waste Combustor Emissions

- o Integrated Environmental Management Program

- o Methodology for Valuing Health Risks of Ambient Lead Exposure (Clean Air Scientific Advisory Committee)

- o A Damage Function Assessment of Building Materials: The Impact of Acid Deposition
  (Clean Air Scientific Advisory Committee)

- o Interim Procedures for Estimating Risk Associated with Exposure to Mixtures of Chlorinated Dibenzo- p-Dioxins and Dibenzofurans

Advisory Documents

- o Guidelines for Water Quality Advi ries for Human Health and Aquatic Life (2 issues)

- Drinking Water Health Advisories for 37 Compounds (3 reviews): acrylamide, benzene, p-dioxane, ethylbenzene, ethylene glycol, hexane, legionella, methylethylketone, styrene, toluene, xylene, arsenic, barium, cadmium, chromium, cyanide, lead, mercury, nickel, nitrate/nitrite, carbon tetrachloride, chlorobenzene, dichlorobenzene, 1,2-dichloroethane, cis and trans 1,2-dichloroethylene, 1,1-dichloroethylene, dichloromethane, dichloropropane, dioxin, epichlorohydrin, hexachlorobenzene, polychlorinated biphenyls, tetrachloroethylene, 1,1,2-trichloroethylene, 1,1,-trichloroethylene, and vinyl chloride.

Specific Scientific Proposals, Studies or Surveys

- Design of the National Radon Survey
- Idaho Radionuclide Exposure Study
- Kanawha Valley Toxics Screening Study
- National Surface Water Monitoring Study
- Laboratory Measurement Proficiency Program for Radon Testing

Presidential Research Budget Proposals

- Evaluation of the President's Proposed Budget for the Office of Research and Development for FY 1988

Reviews Requested by Other Federal Agencies

- Recommended Research on Effects of Stratospheric Ozone Depletion - EPA and the Office of Management and Budget

EPA Reports to Congress

- Report to Congress on Indoor Air Pollution and Radon
- Comparative Health Effects of Drinking Water Treatment Technologies
- National Dioxin Study

SAB Initiative

- Workshop on Mouse Liver and Rate Kidney Tumors and Their Role in Human Risk Assessment (2 issues)

II. Science Advisory Board Operating Procedures

To ensure the quality of technical analyses used in its decision making process, EPA has expanded its use of various formal and informal methods of peer review. The Science Advisory Board (SAB), established by the Congress through the passage of the Environmental Research, Development and Demonstration Authorization Act (ERDDAA) amendments of 1978, is the principal independent advisory body used by the Administrator to formally obtain advice on the scientific aspects of a large number of important public health and environmental issues.

The Agency's referral of studies and assessments to the SAB for peer review preceeded, but is consistent with, the recommendations of the National Academy of Sciences in its report on risk assessment in the Federal government.[1] A major recommendation of this report was for regulatory agencies to create independent peer review panels to review scientific studies that form the basis for major agency regulatory actions.

The Congress has required specific SAB review of such issues as the scientific bases of National Ambient Air Quality Standards, National Emission Standards for Hazardous Air Pollutants, and National Primary Drinking Water Standards. Section 8(e) of ERDDAA also mandates that the Agency make available for SAB review "any proposed criteria document, standard, limitation or regulation."

In light of the growing importance of the SAB to EPA's regulatory and research programs, the Agency has decided to formalize some of the procedures governing the selection of SAB members and the operations of the Board. In the past, the Agency has been extremely fortunate in having leaders of the scientific community serve on the SAB and will seek to continue this high level of expertise on the Board through a more formal selection process.

While this notice makes no significant changes in the SAB's procedures for reviewing studies and providing advice to the Agency, it is important for the public to know what those procedures are. Other aspects of the SAB's operations, including its objectives, responsibilities, and composition are set forth in its Charter (which is attached as Annex A). The charter of a Federal advisory committee must be renewed every two years.

Procedures Governing the Selection of SAB Members

Members of the SAB are selected by the Administrator and Deputy Administrator. Members are appointed for staggered terms of one to four years, which may be extended at the end of the term for the same range of time. The SAB has solicited nominations for membership from the general public in the past.[2] To continue ensuring the highest caliber participant on the SAB, EPA is announcing today a more formal process to solicit nominations of qualified scientists, engineers, or other disciplines as appropriate for review of the technical issues addressed by the Board. Such nominations will be solicited from:

- Federal research agencies such as the National Institutes of Health, the National Center for Health Statistics, and the National Science Foundation.

- The Presidents of the National Academy of Sciences, National Academy of Engineering and the Institute of Medicine.

- o Professional scientific societies.
- o Current or former SAB members.
- o The public (including the private sector and public interest groups).
- o EPA staff.

EPA will solicit such nominations by Federal Register notice as frequently as needed, but no less than every other year. To achieve balanced points of view among various schools of scientific thought, individuals will be appointed to the Board on the basis of their expertise and not their organizational affiliation or constituency. In announcing a solicitation, EPA will also identify particular scientific disciplines where expertise is needed. Members of the Board will be selected from among the nominated individuals. The Agency will publish in the Federal Register, on an annual basis, the current roster of SAB members. Members of the public are encouraged to submit nominees for Board membership at any time and need not await a formal solicitation from EPA.

SAB members appointed by the Administrator or Deputy Administrator serve on various standing committee, subcommittees or ad hoc panels, or serve as members-at-large. In addition, the Board uses consultants with more specialized expertise on as-needed basis. Such consultants, who must meet the same standards of scientific expertise as members, do not vote on formal matters before the Board.

Conflict of Interest

Each SAB member or consultant is required to exercise judgment prior to any meeting as to whether a potential conflict of interest might exist due to his or her occupational affiliation, professional or research activity or financial interest on a particular matter before the Board. If there is a potential conflict of interest, the member or consultant must excuse himself/herself from the deliberations and/or votes of committees or subcommittees of the Board with respect to that matter.

SAB members and consultants currently complete an annual Confidential Statement of Employment and Financial Interests (Form 3120-1) beginning at the time of their initial appointment. Those compensated at or above the GS-16 rate, and who work more than 60 days per fiscal year, must conform to the financial disclosure provisions of the 1978 Ethics in Government Act. In addition, the SAB is currently in the process of preparing specific conflict of interest guidelines for its members and consultants. These guidelines, when completed, will be published in the Federal Register.

The SAB Review Process

The advisory process employed by the SAB will vary depending on the nature of the technical issues undergoing review, but certain generalizations concerning the review process can be stated. Most technical issues and scientific data evaluated by the Board are described in technical support documents prepared internally by EPA or by external contractors hired by EPA program offices

in developing regulations, standards, guidance or policy statements. The SAB also evaluates a considerable number of individual programs within the Office of Research and Development. The Administrator has previously instructed program and research offices to seek advice from the SAB as early as possible in the decision making process and, generally, before the proposal in the Federal Register of a regulation or standard, or before the final issuance of criteria, technical support or guidance documents.[3]

In general, the SAB review process involves the following steps:

1. At the direction of the Administrator or Deputy Administrator, each program or research office nominates scientific issues of importance to EPA that are subsequently submitted to the SAB Executive Committee for approval to authorize a SAB review. These issues are in addition to those that are legally required. The SAB can also initiate written requests to the Administrator to review individual issues. Based on consultations between the Executive Committee and senior EPA program and research officials, the Committee assigns priorities for the SAB. These priorities are subject to adjustment by the Executive Committee of the SAB in consultation with the Agency during the year.

2. The issues identified in step 1 are referred by the Executive Committee to an appropriate existing SAB committee for review, or the Executive Committee, as the need arises, establishes an appropriate subcommittee to conduct the review.

3. Additional expertise is recruited, if needed. A schedule for the review is established.

4. Agency documents and studies by outside contractors are transmitted to the SAB committee. Preliminary briefings or site visits are conducted if needed. At this stage of the advisory process, the Administrator has directed that program or research offices prepare an "issues paper" which synthesizes the relevant scientific data, states the EPA position based on such data and defines the specific issues to be addressed by the SAB.

5. EPA documents are formally reviewed in meetings open to the public. While some meetings may be closed in accordance with specific provisions of the Government in the Sunshine Act (5 U.S.C. 552b Section 10 [d] of the Federal Advisory Committee Act) such action is only taken for compelling reasons. In addition, public comments of a scientific nature are accepted by the SAB. Following discussion within the review committee and between the committee and EPA staff and members of the public, the committee prepares a statement of its major conclusions and recommendations.

6. Based upon EPA and SAB discussions, EPA may prepare an additional draft of its technical documents and may request another cycle of scientific review by the committee. If this does not occur, the committee's final report is transmitted to the Executive Committee for approval.

7. The Executive Committee reviews the report and, if approved, transmits it to the Administrator. The final SAB report becomes a public document which is available for public inspection and copying.

8. The director of the relevant program or research office, or the Administrator, formally responds in writing to SAB advice, noting areas where the advice will be accepted or not accepted, and the reasons for such action.

Timeliness of SAB Review

To avoid delaying important EPA decisions, the scientific review process must, to the extent feasible, be conducted in an expeditious manner without sacrificing a high level of quality in both the preparation and review of technical documents. Consistent with this objective, the SAB establishes a schedule for the preparation of each report. Similarly, the Agency's response to the SAB's advice should be transmitted promptly. In general, the SAB seeks to submit a written report to the Administrator within 90 days of the completion of a review. EPA seeks to respond in writing to SAB advice within the same time frame following the formal submittal of a final SAB report.

Submittal of Questions and Nominations

Members of the public who have questions pertaining to the above stated procedures or who wish to recommend nominees for SAB membership should write Dr. Terry F. Yosie, Director, Science Advisory Board, U. S. Environmental Protection Agency, (A-101), 401 M Street, S.W., Washington, D. C. 20460.

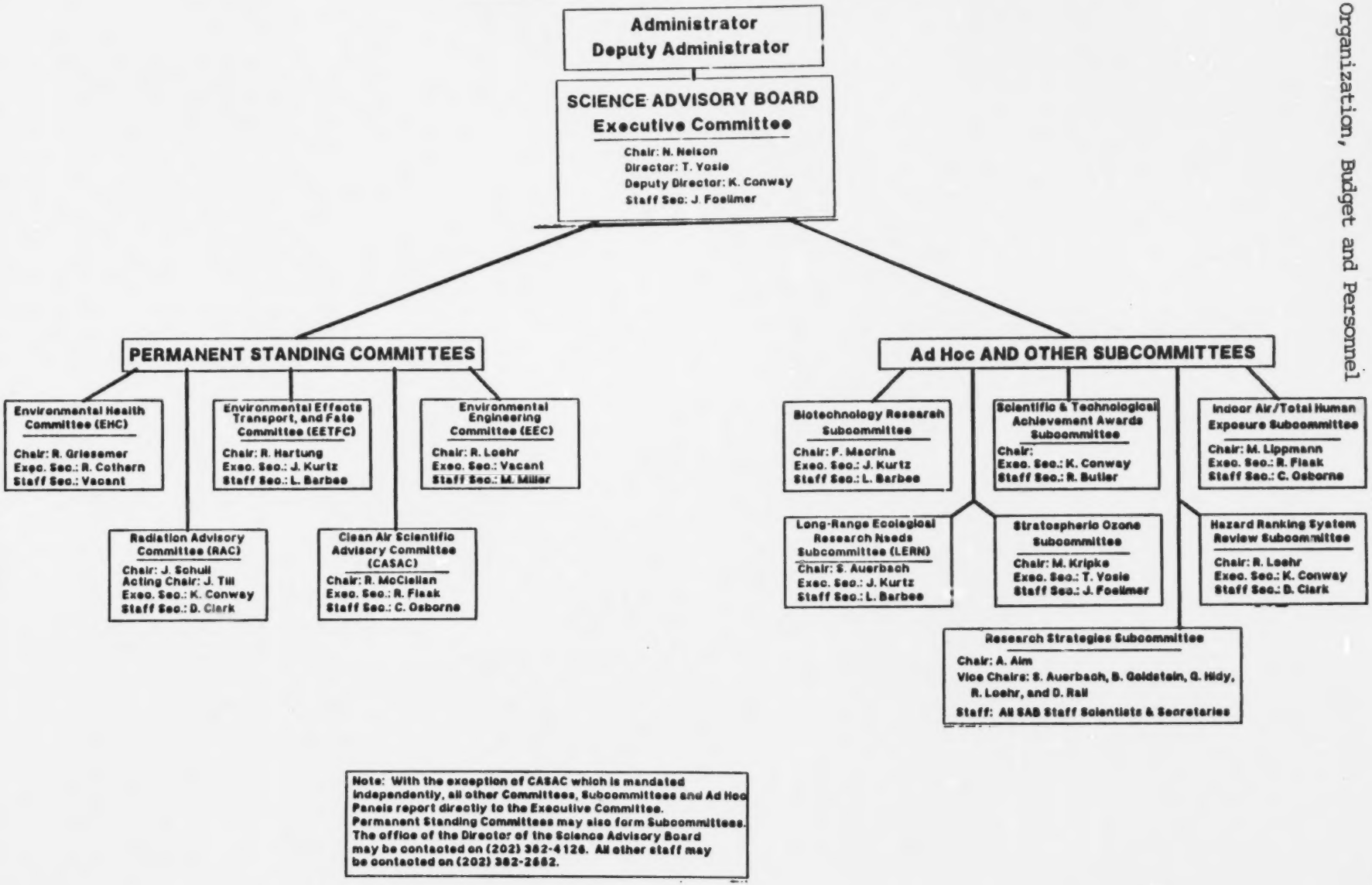
References

1. National Research Council, "Risk Assessment in the Federal Government: Managing the Process,: (National Academy Press, Washington, D. C., 1983).

2. 49 Federal Register, 33169, August 21, 1984.

3. Memorandum from EPA Administrator Lee M. Thomas to Assistant Administrators and Office Directors, "Improving the Agency's Use of the Science Advisory Board," June 25, 1985.

## ORGANIZATION OF THE SCIENCE ADVISORY BOARD




Note: With the exception of CASAC which is mandated independently, all other Committees, Subcommittees and Ad Hoc Panels report directly to the Executive Committee. Permanent Standing Committees may also form Subcommittees. The office of the Director of the Science Advisory Board may be contacted on (202) 382-4126. All other staff may be contacted on (202) 382-2552.

## Subcommittees of Major Standing Committees

### Environmental Effects, Transport and Fate Committee

- Municipal Waste Combustion Subcommittee
  Chair: Dr. Rolf Hartung

- Water Quality Subcommittee
  Chair: Dr. Kenneth Dickson

- Surface Water Monitoring Subcommittee
  Chair: Dr. Kenneth Dickson

### Environmental Health Committee

- Drinking Water Subcommittee
  Chair: Dr. Gary Carlson

- Halogenated Organics Subcommittee
  Chair: Dr. John Doull

- Metals Subcommittee
  Chair: Dr. Bernard Weiss

### Radiation Advisory Committee

- National Radon Survey Design Subcommittee
  Chair: Dr. Oddvar Nygaard

- Radionuclides in Drinking Water Subcommittee
  Chair: Dr. Warren Sinclair

- Radon Mitigation Subcommittee
  Chair: Dr. John Till

### Environmental Engineering Committee

- Alternate Concentration Limits Subcommittee
  Co-Chairs: Mr. Richard Conway
  Dr. Mitchell Small

- Land Disposal Subcommittee
  Chair: Dr. Raymond Loehr

- Waste Minimization Subcommittee
  Chair: Mr. Richard Conway

- Underground Storage Tank Subcommittee
  Chair: Dr. Keros Cartwright

Clean Air Scientific Advisory Committee

- Acidic Aerosols Subcommittee
  Chair: Dr. Mark Utell

- Lead Benefit Analysis Subcommittee
  Chair: Dr. Robert Rowe

- Lead/Ozone Research Needs Subcommittee
  Chair: Dr. Morton Lippmann

- Material Damage Review Subcommittee
  Chair: Dr. Warren Johnson

- Visibility Subcommittee
  Chair: Dr. Shep Burton

## SCIENCE ADVISORY BOARD STAFF

DIRECTOR ..... Terry F. Yosie

Secretary ..... Joanna A. Foellmer

Clerk-Typist ..... Vacant

DEPUTY DIRECTOR ..... Kathleen W. Conway

Secretary ..... Janet R. Butler

PROGRAM ANALYST ..... Cheryl B. Bentley

CLEAN AIR SCIENTIFIC ADVISORY COMMITTEE

Environmental Scientist ..... A. Robert Flaak

Secretary ..... Carolyn L. Osborne

ENVIRONMENTAL EFFECTS, TRANSPORT AND FATE COMMITTEE

Environmental Scientist ..... Janis C. Kurtz

Secretary ..... Lutithia V. Barbee

ENVIRONMENTAL ENGINEERING COMMITTEE

Environmental Engineer ..... Vacant
Eric H. Males
(Acting until 8/31/87)

Environmental Engineer ..... Harry Torno
(1 year leave of absence)

Secretary ..... B. Marie Miller

ENVIRONMENTAL HEALTH COMMITTEE

Environmental Scientist ..... C. Richard Cothern

Secretary ..... Vacant

RADIATION ADVISORY COMMITTEE

Environmental Scientist ..... Kathleen W. Conway

Secretary ..... Dorothy M. Clark

Stay-in-School Assistants ..... Lavonia E. Shirley
Derek L. Jackson

SCIENCE ADVISORY BOARD FISCAL YEAR 1987 BUDGET

| | | |
|---|---|---|
| Compensation | $ | 851,246.44 |
| (Members, Consultants and Staff) | | |
| Travel | $ | 281,888.41 |
| Other Contractual Services | $ | 53,832.00 |
| (Court reporting services, equipment, training, maintenance for word processing equipment, copying machine, etc.) | | |
| Total | $ | 1,186,966.80 |

## IV. Reports Issued

### SCIENCE ADVISORY BOARD REPORTS
### (FISCAL YEAR 1987)

Report to the Administrator on a review conducted by the Clean Air Scientific Advisory Committee of the Air Quality Criteria for Ozone and other Photochemical Oxidants--Clean Air Scientific Advisory Committee--October 22, 1986--SAB-CASAC-87-001.

This report documents the Committee's findings relative to its review of the Air Quality Criteria for Ozone and Other Photochemical Oxidants prepared by the Agency's Environmental Criteria and Assessment Office. CASAC unanimously concluded that this document represents a scientifically balanced and defensible presentation and interpretation of the scientific literature.

Report to the Administrator on a review of the Agency's Research Program On Indoor Air Quality--Indoor Air Quality Research Review Panel--November 5, 1986--SAB-EC-87-002.

The Panel concluded that while the indoor air research being conducted was of high quality, the research taken as whole did not constitute a "program" in indoor air quality. The major recommendations include: 1) development and adoption of a clear policy statement that indoor air quality is an important and essential component of the responsibility of the Agency, 2) assigning responsibility for the indoor air quality program to an individual of appropriate scientific statute with specific experience in this area, 3) the proposed limited field survey should not be carried out as presented since the resources that it would demand are not commensurate with the scientific information and insights which would be derived, 4) preparation of a relative risk assessment for more important pollutants (including asbestos, biological contaminants, criteria air pollutants, and toxic chemicals) in order to develop a framework for decision making, and 5) eight general conclusions and recommendations concerning current research in indoor air quality.

Report to the Administrator on a review of the final draft of the Agency's Guidance for the Establishment of Alternate Concentration Limits for RCRA Facilities--Environmental Engineering Committee--October 24, 1986--SAB-EEC-87-003.

The Committee conducted a preliminary review of the above document in March 1986, and identified obvious errors or omissions which are explained in detail in its initial report. The Office of Solid Waste asked the Committee to review the final draft ACL guidance when it was ready for publication in the Federal Register. This report represents the Committee's review of the final draft which was found to be well-written and technically sound.

* SINGLE COPIES OF THESE REPORTS ARE AVAILABLE AT NO CHARGE FROM THE SCIENCE ADVISORY BOARD. SAB REPORT NUMBERS SHOULD BE REFERRED TO WHEN MAKING REQUESTS. PLEASE ADDRESS REQUESTS TO SCIENCE ADVISORY BOARD (A-101F), ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460, ATTENTION CHERYL B. BENTLEY OR CALL (202) 382-2552.

Report to the Administrator on a SAB review requested by the Office of Drinking Water (ODW) of thirty-seven drinking water health advisories--Environmental Health Committee--October 24, 1986--Metals Subcommittee (SAB-EHC-87-004); Halogenated Organics Subcommittee (SAB-EHC-87-005); and Drinking Water Subcommittee (SAB-EHC-87-006).

The Environmental Health Committee has reviewed 37 health advisories for drinking water. Health advisories are action levels for exposures of different duration and are not regulations. Three Subcommittees participated in the reviews. Each one prepared general comments as well as specific comments on specific substances as follows:

Office of Drinking Water Health Advisories for 37 Compounds:
acrylamide, benzene, p-dioxane, ethylbenzene, ethylene glycol, hexane, legionella, methylethylketone, styrene, toluene, xylene, arsenic, barium, cadmium, chromium, cyanide, lead, mercury, nickel, nitrate/nitrite, carbon tetrachloride, chlorobenzene, dichlorobenzene, 1,2-dichloroethane, cis and trans 1,2-dichloroethylene, 1,1-dichloroethylene, dichloromethane, dichloropropane, dioxin, epichlorohydrin, hexachlorobenzene, polychlorinated biphenyls, tetrachloroethylene, 1,1,2-trichloroethylene, 1,1,-trichloroethylene, and vinyl chloride.

Overall the Environmental Health Committee reached the following conclusions:

- The scientific quality of health advisories were uneven.
- The Office of Drinking Water has made a commendable effort in providing exposure analysis information.
- A major problem in the health advisories is that they are intended for a diversity of readers, who have widely varying background levels and concerns.
- Communication would be enhanced if the Office of Drinking Water adopted a three step process to include a Criteria Document, a health advisory and narrative summary for each substance.

Report of the Director of the Science Advisory Board for Fiscal Year 1986--October 1986--SAB-87-007.

This is the Science Advisory Board's (SAB) first in a series of SAB annual reports which is intended to inform EPA, SAB members and consultants, and other interested constituencies of the Board's continuing activities. In addition, the report represents an effort to promote a better understanding of the Board's role in decision making, and its efforts to provide scientific advice.

Report to the Administrator on a review of a draft document entitled "Interim Procedures for Estimating Risk Associated with Exposure to Mixtures of Chlorinated Dibenzo-p-Dioxins and Dibenzofurans", prepared by the Agency's Risk Assessment Forum--Dioxin Toxic Equivalency Methodology Subcommittee--November 4, 1986--SAB-EC-87-008.

The Assistant Administrator for Air requested the Science Advisory Board to review the draft document mentioned above which sets forth an approach for assessing the hazards of Chlorinated Dibenzo-p-Dioxin (CDD) and Dibenzofuran (CDF) mixtures relative to the toxicity of the 2, 3, 7, 8-tetrachloro-dibenzo-p-dioxin (TCDD) isomer. The Subcommittee concluded that the draft document represented a successful interim attempt to articulate a scientific rationale and procedures for developing risk management decisions for mixtures which contain CDD's and CDFs related in structure and activity to TCDD.

Report to the Administrator on a review of the 1986 Addendum (Second Addendum to Air Quality Criteria for Particulate Matter and Sulfur Oxides (1982))--to the 1982 Air Quality Criteria for Particulate Matter and Sulfur Oxides, prepared by the Agency's Environmental Criteria and Assessment Office--Clean Air Scientific Advisory Committee--December 15, 1986--SAB-CASAC-87-009.

The Committee unanimously concluded that the 1986 Addendum, along with the 1982 Criteria Document previously reviewed by CASAC, represent a scientifically balanced and defensible summary of the scientific literature on these pollutants. CASAC requested the review of the 1986 Addendum to the 1982 Air Quality Criteria Document on PM/SOx for the purpose of updating the knowledge of recent scientific studies and analyses. Key findings from earlier documents are summarized which provide a reasonably complete summary of newly available information concerning particulate matter and sulfur oxides, with major emphasis on evaluation of human health studies published since 1981.

Report to the Administrator on a review of the 1986 Addendum to the 1982 Staff Paper on Particulate Matter (Review of the NAAQS for Particular Matter: Assessment of Scientific and Technical Information) prepared by the Office of Air Quality Planning and Standards --Clean Air Scientific Advisory Committee--December 16, 1986--SAB-CASAC-87-010.

The Committee concluded that this document is consistent in all significant respects with the scientific evidence presented and interpreted in the combined Air Quality Criteria Document for Particulate Matter/Sulfur Oxides and its 1986 Addendum. The Committee believes that this document should provide the kind and amount of technical guidance that will be needed to make appropriate revisions to the standards. Major conclusions and recommendations concerning the scientific issues and studies discussed in the Staff Paper Addendum are detailed in the report.

Report to the Administrator on a review of the Agency's Water Quality Based Approach research program--Water Quality Based Approach Research Review Subcommittee--December 11, 1986--SAB-EC-87-011.

As part of a series of Science Advisory Board ongoing reviews on the ORD research program, the SAB reviewed a document entitled "Reference Material for SAB Review of Water Quality Based Approach for the Control of Toxics - Freshwater". This document was prepared by four EPA laboratories that carry out research in this particular program.

The Subcommittee's major conclusion was that methods for deriving water quality criteria have undergone a steady evolution and extensive scientific review. The scientific and regulatory communities have widely accepted the resulting criteria. Additional Subcommittee recommendations were directed at further strengthening the water quality based approach, and integrating it with work related to other areas of toxic controls needing attention.

Report to the Administrator on a review of EPA's National Dioxin Study--National Dioxin Study Review Subcommittee--December 19, 1986--SAB-EC-87-012.

The Subcommittee commended EPA and its personnel for the preparation of a comprehensive, informative and well-written document. With revisions that are identified in the report, the thoroughness of the Study and quality of the data base are scientifically supportable, given the understanding of current knowledge.

The four objectives of the study were: (1) to assess "the associated risks to humans and the environment", (2) a study of the extent of contamination, (3) implementation of site clean-up efforts, and (3) the evaluation of a variety of disposal and regulatory alternatives.

Report to the Administrator on a review of reports developed by the Office of Policy, Planning and Evaluation on landfilling and land application as alternatives to ocean disposal of sewage sludges--Environmental Engineering Committee--January 15, 1987--SAB-EEC-87-013.

The Committee believes that the reports did not provide adequate documentation to justify the choice of methodology and selection of models. The Committee also recommended that the Agency conduct sensitivity analyses to evaluate the importance of variables and uncertainties in the models. In addition, the methodology should use data distributions rather than subjectively defining "representative" conditions.

Report to the Administrator of a report written by the Office of Marine and Estuarine Protection (OMEP) to justify the separate treatment of sewage sludges and dredged materials under the EPA ocean dumping regulations--Environmental Engineering Committee--January 16, 1987--SAB-EEC-87-014.

> Although the Committee is in agreement with the Agency that there are significant differences in the properties of most sewage sludges and dredged materials, significant exceptions exist. Clearly defined, consistent, rigorous, and peer-reviewed procedures must exist to identify these exceptions. OMEP maintains that existing procedures for evaluating dredged materials (under Part 227.13) are adequate; however, based on the documents provided to the Committee, a rigorous protocol for identifying exceptions do not appear to exist.

Report to the Administrator on a review of four sewage sludge risk assessment methodologies developed by the Office of Research and Development for the Office of Water to support the development of national criteria for sludge management--Environmental Engineering Committee--January 15, 1987--SAB-EEC-87-015.

> The Committee recommends that further work be conducted before the risk assessment methodologies are used to develop numerical criteria. Major shortcomings include various unexplained technical omissions and overly conservative and unrealistic risk assessment assumptions, including a sole focus on "maximum exposed individual" risks, the failure to consider a range of risks, and the absence of sensitivity analyses. The outputs from the risk assessment methodologies, as they now exist, are not internally consistent; and they are less consistent (or comparable) among the four sludge management options.

Report to the Administrator on a review of the Agency's radon mitigation research plan--Radiation Advisory Committee--January 12, 1987--SAB-RAC-87-016.

> The Office of Environmental Engineering and Technology (OEET) briefed the Committee on its draft radon mitigation test matrix, which is described as the conceptual framework for a project design within a research plan still under development. The OEET asked the Committee to address the following question, "Does the basic approach for the development of the matrix appear reasonable?"
>
> The Committee reviewed the document and made the following conclusions and recommmendations: (1) the general approach is reasonable, (2) the number of cells in the matrix should be reduced by combining techniques which have similar effects, (3) increased attention should be given to pre- and post-mitigation measurements, and (4) there is a need for greater emphasis on mitigation for new construction.

Report to the Administrator on a review the Office of Research and Development's ecological risk assessment program--Ecological Risk Assessment Research Review Subcommittee--January 16, 1987--SAB-EC-87-017.

> The Subcommittee's major conclusion was that the overall concept of ecological risk assessment developed in this program is comprehensive, scientifically ambitious, and sets forth a research direction for the long-term (perhaps twenty years). In the short-term (five years), it is not achievable as planned, particularly because some of the key elements (density-dependent population, community and ecosystem mechanist models) are based on an incomplete understanding of the fundamental mechanisms. However, the research staff have made a promising start in identifying some of the major issues this program should address.

Report to the Administrator on a review of a draft Addendum to the Health Assessment Document for Perchloroethylene--Environmental Health Committee--January 27, 1987--SAB-EHC-87-018.

> The Committee previously reviewed a draft Health Assessment Document on May 9-10, 1984 and an Addendum is desirable because of newly available data, primarily an inhalation bioassay of rodents by the National Toxicology Program. The Subcommittee believes it is reasonable to describe the weight of the epidemiological evidence in humans as conforming to the EPA guideline for carcinogen risk assessment definition of "inadequate". The Subcommittee concluded that the animal evidence of carcinogenicity is "limited" because of positive results in only one strain of mouse of a type of tumor that is common and difficult to interpret. Therefore, the Subcommittee concluded that perchloroethylene belongs in the overall weight-of-the-evidence category C (possible human carcinogen).

Report to the Administrator on a series of scientific reviews of Agency research programs--Executive Committee--January 16, 1987--SAB-EC-87-019.

> The Board believes that its reviews of Agency research programs have proven to be a highly useful means of assessing the quality and relevance of existing research. These reviews have focused both the SAB's and the Agency's thinking on research plans and needs to a degree never before achieved through preparation and review of the Five Year Research and Development Plan (Research Outlook). The Board believes that its extensive research program reviews fulfill the spirit and intent of Congress for SAB oversight of the Agency's research program.

Report to the Administrator on a review of a draft Drinking Water Criteria Document for Monochlorobenzene--Environmental Health Committee--January 16, 1987--SAB-EHC-87-020.

> The Subcommittee evaluated the animal evidence for carcinogenicity of chlorobenzene to be "inadequate" under EPA's new guidelines based on the lack of a statistically significant increase in the incidence of tumors in female mice, male mice and female rats, and on the basis of the perception of a diminished biologic significance of reported malignant neoplastic nodules of the liver in the highest dose-treated male rats. This evidence would place chlorobenzene into the overall weight-of-the-evidence category "D" (not classified).

Report to the Administrator on a review of a draft Health Assessment Document for Polychlorinated Dibenzofurans--Environmental Health Committee--January 16, 1987--SAB-EHC-87-021.

> The available information on polychlorinated dibenzofurans is scant. For this reason, staff utilized information about polychlorinated dibenzo-p-dioxins in the assessment. The scientific theory that supports the use of this analogy is sound. Both groups of substances are thought to cause biological effects by binding with different affinities to the same intracellular receptor molecule. However, the draft document assumes this theory for one plausible effect of receptor binding, namely developmental abnormalities, and not for other effects which have been attributed to polychlorinated dibenzo-p-dioxins in previous Agency assessments, such as carcinogenicity. The Subcommittee requests that EPA either assume the same theory for all effects or provide an explanation of why carcinogenic effects do not follow from binding to the receptor.

Report to the Administrator on a review of the 1986 Addendum to the 1982 Staff Paper on Sulfur Oxides (Review of the National Ambient Air Quality Standards for Sulfur Oxides: Updated Assessment of the Scientific and Technical Information) prepared by the Agency's Office of Air Quality Planning and Standards (OAQPS)--Clean Air Scientific Advisory Committee--February 19, 1987--SAB-CASAC-87-022.

> The Committee concluded that this document is consistent in all significant respects with the scientific evidence presented and interpreted in the combined Air Quality Criteria Document for Particulate Matter/Sulfur Oxides (1982) and its 1986 Addendum, and that the Staff Paper and its Addendum provide the Administrator with the kind and amount of technical guidance that will be needed to make decisions with respect to the national ambient air quality standards for sulfur oxides.

Report to the Administrator on a review of the Office of Research and Development's Integrated Air Cancer Project--Integrated Air Cancer Project Research Review Subcommittee--February 25, 1987--SAB-EC-87-023.

This is the first time the Agency has addressed the carcinogenic potency of mixtures of materials in the ambient air and is a critical step towards characterizing the exposure of humans to a complex environment. The Subcommittee found the Integrated Air Cancer Project to be scientifically well-founded. The project represents a logical and appropriately innovative approach that can achieve its long-range goals of addressing these complex environmental health issues. In addition, the project effectively exploits some of the research tools and results developed in the past decade and presents an example of effective multi-laboratory research management within the Agency.

Report to the Administrator on a second SAB annual review of the President's proposed budget for the Office of Research and Development--Research and Development Budget Subcommittee--March 6, 1987--SAB-EC-87-024.

The scope of the Subcommittee's review addresses three major issues: 1) trends in the research budget; 2) continuing core needs of EPA's research program; and 3) comments on specific research programs in eight major areas--air, radiation, water quality, drinking water, pesticides/toxic substances, hazardous wastes/Superfund, energy/acid rain and interdisciplinary research.

Report to the Administrator on a review of EPA's risk assessment document entitled An Assessment of the Risks of Stratospheric Modification--Stratospheric Ozone Subcommittee--March 23, 1987--SAB-EC-87-025.

The Subcommittee concluded that EPA's draft document represents an extensive effort to develop an integrated risk assessment based upon currently available scientific information to ascertain the potential threat to the stratosphere posed by a continued growth world-wide of emissions of chlorofluorocarbon (CFCs) compounds. The Subcommittee generally finds that EPA has done a commendable job of assembling the relevant scientific information in the body of the document. The Subcommittee has provided many specific recommendations for improving the treatment of particular scientific issues and characterizing scientific uncertainties which are detailed in the report.

Report to the Assistant Administrator for Research and Development on the 1986 Scientific and Technological Achievement Awards--1986 Scientific and Technological Achievement Awards Subcommittee--April 6, 1987--SAB-EC-87-026.

The Subcommittee reviewed 113 papers nominated by EPA's Office of Research and Development for the 1986 Scientific and Technological Achievement Awards; 34 were recommended for awards. The Subcommittee noted that more papers were nominated for awards this year (113 versus 92 in 1985), but a higher percentage (30% versus 25%) of those nominated have been recommended for an award. Papers in the Control Technology category were judged worthy of an award for the first time in several years.

The Subcommittee made the following three suggestions: (1) the call for papers should be widened so that qualifying work of engineers and scientists throughout the Agency can be considered; (2) a letter of recognition should be sent to scientists and engineers outside the Agency who co-authored award-winning papers; and (3) recognizing in some other way a number of papers which were of very high quality but did not qualify for awards.

Report to the Administrator on a review of a document jointly prepared by the Office of Air Quality Planning and Standards and the Environmental Criteria and Assessment Office entitled Methodology for the Assessment of Health Risks Associated with Multiple Pathway Exposure to Municipal Waste Combustor Emissions--Municipal Waste Combustion Subcommittee--April 9, 1987--SAB-EET&FC-87-027.

The Subcommittee considered the proposed methodology to be a considerable improvement over other multi-media risk assessment methodologies previously developed by EPA and reviewed by the Science Advisory Board. The current methodology was more comprehensive in scope and, in general, provides a conceptual framework that ought to be expanded to other environmental problems.

The Subcommittee identified several areas in this methodology that need further consideration, including: the applicability of the Hampton incinerator facility and associated data to represent typical mass burn technology; the failure to use data from current best available control technology facilities for model validation; separate treatment of particulate and gaseous emissions and their fate, i.e., downwash; the need to use best available kinetics in predicting soil degradation; exposure resulting from the landfilling of ash; using the maximally exposed individual (MEI) concept; and the treatment of plant (and herbivore) exposure.

Report to the Administrator on a review of a Health Assessment Document for Beryllium--Environmental Health Committee--April 24, 1987--EHC-87-028.

The Metal's Subcommittee agrees with the conclusions reached in the draft document concerning the evidence of carcinogenicity using epidemiological and animal data. The Subcommittee was unable to reach a consensus on advising the Agency on the use of existing data to estimate an upper bound to human risk. In addition, the Subcommittee continues to disagree with the Agency's choice of a model for the pharmacokinetics of inhaled beryllium particulates. These and other issues are detailed in the report.

Report to the Administrator on a review of the Drinking Water Criteria Document for Nitrate/Nitrite--Environmental Health Committee--May 11, 1987-SAB-EHC-87-029.

The Drinking Water Subcommittee advised further technical changes before finalizing the document such as: (1) clarifying the use of the Walton study, including limitations of the study and the weight assigned to its use for regulatory decision making; and (2) the representation of a clearer scientific rationale on the selection of margins of safety. Additional comments can be found in the report.

Report the the Administrator on a review of the progress made by the Office of Research and Development in addressing EPA's needs for extrapolation models--Extrapolation Models Subcommittee--May 26, 1987--SAB-EC-87-030.

The Subcommittee's major finding was that there is no overall, conceptually integrated Agency research program on extrapolation modeling, but a conglomeration of investigator-initiated projects, many of which are commendable in their design and implementation.

Major recommendations of the Subcommittee suggested that EPA should develop a comprehensive plan for an extrapolation models research program that should: 1) articulate an overall conceptual objective towards which individual projects would aim; 2) enhance EPA's risk assessment-risk management framework for decision making; 3) develop a framework that promotes more planning and resource stability in support of the research; 4) provide a common nomenclature; 5) improve communication among the Agency's organizational components; and 6) explain to the nonscientist how the research on extrapolation models support the Agency's regulatory decisions.

Report to the Administrator on a review of EPA's Draft Kanawha Valley Toxics Screening Study--Integrated Environmental Management Subcommittee--May 27, 1987--SAB-EC-87-031.

The Subcommittee unanimously concluded that the Kanawha Valley study represented an important component of EPA's overall effort to develop methodologies to define public health and environmental priorities. Studies such as this provide (1) valuable technical challenges and experiences to EPA staff, particularly to regional offices; and (2) provide a valuable means for developing closer working relationships with state and local officials and the general public.

In general, the Subcommittee viewed the Draft Kanawha Valley Toxics Screening Study as one step of a continuing process to assess risks. The current study addresses chronic health exposures to carcinogens which represent one of many public health concerns in the Valley. As a follow-up to the current study, the Subcommittee recommended the following two additional steps:

- o expanded monitoring of air toxics, and use of monitored values to obtain more precise estimates of exposure and health risks; and

- o greater focus on accidental releases and fugitive emissions as areas of public health concern.

Report to the Administrator on a review requested by the Office of Air Quality Planning and Standards entitled "Methodology for Valuing Health Risks of Ambient Lead Exposure" prepared by Mathtech, Inc., an EPA contractor--Clean Air Scientific Advisory Committee--June 30, 1987--SAB-CASAC-87-032.

The Subcommittee on Lead Benefit Analysis of the Clean Air Scientific Advisory Committee conducted a review of the above document and concluded that the revised document provides a defensible presentation of the benefits that were analyzed. The revised document included written comments made by the Subcommittee prior to its March 10, 1987 public meeting. However, there are potentially substantial benefit categories that are currently excluded in the analysis such as the likely relative magnitude of benefits for individuals in lead-based painted homes, and how fetal impacts (reduced birth weight and early developmental effects) and other benefit categories that could be included in future assessments.

Report to the Administrator on a review requested by the Office of Policy, Planning and Evaluation entitled "A Damage Function Assessment of Building Materials: The Impact of Acid Deposition" prepared by Mathtech, Inc., an EPA contractor--Clean Air Scientific Advisory Committee--June 30, 1987--SAB-CASAC-87-033.

The Material Damage Review Subcommittee of the Clean Air Scientific Advisory Committee conducted a review of the above document and concluded that the 1986 Mathtech report was well done and represented an improvement over earlier efforts, given the limitations in available data and the scope of the study. Identified in the report are omissions, errors, and biases inherent in the work, and attempts to account for a range of possible alternatives by furnishing lower and uppper damage estimates.

In view of the uncertainties involved, especially in paint damage costs, the Subcommittee believes that the total costs from acid deposition should not be used in the Sulfur Oxides National Ambient Air Quality Standards (NAAQS) rulemaking process. Nevertheless, the conceptual framework and procedures that are used in this report do provide useful information which should be considered. The analyses contained in this report should be considered as complementary to the supply/demand model approach that is now incorporated in the draft Regulatory Impact Analysis (RIA) for Sulfur Oxides.

Report to the Administrator on a review of the Office of Policy, Planning and Evaluation's Integrated Environmental Management Program (IEMP)--Executive Committee--July 24, 1987--SAB-EC-87-034.

The program's lack of clearly stated scientific assumptions and objectives, and its need for a more consistent approach to peer review, constitute its most serious technical deficiencies. The absence of consistently documented assumptions and objectives, and the ad hoc approach to peer review, has created difficulties in assessing whether the program as a whole, or specific studies, have achieved their overall goals.

Report to the Administrator on a review of the Office of Drinking Water's Assessment of Radionuclides in Drinking Water and Four Draft Criteria Documents: Man-Made Radionuclide Occurrence; Uranium; Radium; and Radon by the Drinking Water Subcommittee--Radiation Advisory Committee--July 27, 1987--SAB-RAC-87-035.

At the request of the Office of Drinking Water, the Committee addressed four issues: the weighting factors to be used in effective dose equivalent calculations, the chemical toxicity and radiotoxicity of uranium, the linearity of the dose-response curve for naturally occurring radionuclides, and the appropriate use of the relative and absolute risk models.

Report to the Administrator on the Recommendations for Future Research on National Ambient Air Quality Standards for Ozone and Lead--Clean Air Scientific Advisory Committee--September 30, 1987--SAB-CASAC-87-036.

The research recommendations for ozone are presented in three parts: 1) atmospheric chemistry; 2) health effects; and 3) agriculture, forests and related ecosystems. Each part is critical to setting an ozone NAAQS. The latter two areas are critical in establishing exposure-response relationships for the effects that ambient ozone produces. However, without a better understanding of exposure profiles, scientists and regulators cannot accurately establish the extent of the effects of ambient ozone exposure on public health and welfare. Furthermore, without a better understanding of atmospheric chemistry, we cannot predict either the frequency of excessive exposures or the influence of the various souces of the ozone precursors on the ambient concentrations.

SCIENCE ADVISORY BOARD MEMBERSHIP

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| 2. Dr. Martin Alexander<br>Professor, Dept. of Agronomy<br>Cornell University<br>Ithaca, New York | Former SAB Member | Member, Environmental Effects, Transport & Fate |
| 3. Alvin L. Alm<br>Pres. & Chief Executive Officer<br>Alliance Technologies Corp.<br>213 Burlington Road<br>Bedford, Massachusetts | None | Member-At-Large |
| 4. Dr. Stanley I. Auerbach<br>Director, Environmental Sciences Division, Oak Ridge National Laboratory<br>Oak Ridge, Tennessee | None | Member, Executive Committee |
| 5. Dr. Joan Berkowitz, President<br>Risk Science International<br>Washington, D.C. | Former SAB Consultant | Member, Environmental Engineering Committee |
| 6. Dr. Gary P. Carlson<br>Professor of Toxicology<br>Dept. of Pharmacology and Toxicology<br>Purdue University<br>West Lafayette, IN | Former SAB Consultant | Member, Environmental Health Committee |
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| 15. Dr. Robert Frank<br>The Johns Hopkins School<br>Of Hygiene and Public<br>Health<br>Baltimore, MD | Consultant<br>CASAC &<br>Environmental<br>Health Committee<br>Consultant | Member, Clean Air<br>Scientific Advisory<br>Committee |
| 16. Dr. Sheldon K. Friedlander<br>Parsons Professor of<br>Chemical Engineering<br>University of California<br>at Los Angeles<br>Los Angeles, CA | SAB Technology<br>Committee 1975-78<br>CASAC 1978-1982 | Member-At-Large |
| 17. Dr. Wilford R. Gardner<br>Head, Department of Soils,<br>Water and Engineering<br>University of Arizona<br>Tucson, Arizona | None | Member, Environmental<br>Effects, Transport<br>& Fate Committee |
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| 19. Dr. Earnest F. Gloyna<br>Dean, College of Engineering<br>University of Texas at Austin<br>Austin, Texas | Chair, Executive<br>Committee | Member, Executive<br>Committee |
| 20. Mr. George P. Green<br>Public Service Company of Colorado<br>Manager, Production Services<br>Littleton, CO | None | Member, Environmental<br>Engineering Committee |

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| 21. Dr. Richard A. Griesemer<br>Director, Biology Division<br>Oak Ridge National Laboratory<br>Oak Ridge, Tennessee | None | Chair, Environmental Health Committee |
| 22. Dr. Rolf Hartung<br>Professor of Environmental Toxicology, School of Public Health<br>University of Michigan<br>Ann Arbor, Michigan | None | Chair, Environmental Effects, Transport, & Fate Committee |
| 23 Dr. J. William Haun<br>Vice President<br>Engineering Policy<br>General Mills, Inc.<br>Minneapolis, MN | None | Member, Environmental Engineering Committee |
| 24. Dr. George M. Hidy<br>President<br>Desert Research Institute<br>Reno, NV | None | Member, Executive Committee |
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| 26. Dr. Seymour Jablon<br>Director, Medical Follow-up Agency<br>National Research Council<br>Wash., D.C. | None | Member, Radiation Advisory Committee |

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| 27. Dr. Kenneth D. Jenkins<br>Professor of Biology<br>California State University<br>at Long Beach<br>Long Beach, CA | Former SAB Consultant | Member, Environmental Effects, Transport & Fate Committee |
| 28. Dr. E. Marshall Johnson<br>Professor and Chairman<br>Department of Anatomy<br>Jefferson Medical College<br>Philadelphia, PA 19107 | Former SAB Consultant | Member, Environmental Health Committee |
| 29. Dr. Warren B. Johnson<br>Manager, Research Aviation<br>Facility, National Center for<br>Atmospheric Research<br>Boulder, CO | None | Member, Clean Air Scientific Advisory Committee |
| 30. Dr. Nancy Kim<br>Director, New York Department<br>of Health<br>Bureau of Toxic Substance<br>Assessment<br>Albany, New York | None | Member, Environmental Health Committee |
| 31. Dr. Richard A. Kimerle<br>Senior Science Fellow<br>Monsanto Company<br>St. Louis, Missouri | Former SAB Consultant | Member, Environmental Effects, Transport & Fate Committee |

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| 32. Margaret L. Kripke<br>Professor & Chairman<br>Dept. of Immunology<br>M.D. Anderson Hospital<br>and Tumor Institute<br>Houston, Texas | Former SAB Consultant | Member-At-Large |
| 33. Dr. Timothy V. Larson<br>Research Associate<br>Environmental Engineering & Science Program<br>Department of Civil Engineering<br>Seattle, Washington | Former SAB Consultant | Member, Clean Air Scientific Advisory Committee |
| 34. Dr. Terry Lash<br>Director<br>Department of Nuclear Safety<br>Springfield, Illinois | Former SAB Consultant | Member, Radiation Advisory Committee |
| 35. Dr. Joseph Ling<br>Vice President Retired<br>Consultant<br>3M Company<br>St. Paul, MN | None | Member, Environmental Engineering Committee |
| 36. Dr. Morton Lippmann<br>Professor of Env. Medicine<br>Institute of Environmental Medicine<br>New York University Medical Center<br>New York, New York | Former SAB Consultant | Chair, Clean Air Scientific Advisory Committee |

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| 37. Dr. Raymond Loehr<br>Civil Engineering Department<br>University of Texas<br>Austin, Texas | SAB Technology Committee 1976-1981 | Chair, Environmental Engineering Committee |
| 38. Dr. William Lowrance<br>Senior Fellow and Director<br>Life Sciences Program<br>The Rockefeller University<br>New York, New York | None | Member, Executive Committee |
| 39. Dr. Francis L. Macrina<br>Department of Microbiology & Immunology<br>Virginia Commonwealth University<br>Richmond, Virginia | Former SAB Consultant | Member-At-Large |
| 40. Dr. Roger O. McClellan<br>Lovelace Biomedical and Environmental Research Inst.<br>Albuquerque, New Mexico | SAB Executive Comm., 1976-1980<br>Environmental Health Comm., 1980-82<br>Environmental Health Committee Chair | Member, Executive Committee |
| 41. Dr. Francis C. McMichael<br>Professor of Civil Engineering<br>Carnegie-Mellon University<br>Pittsburgh, PA | SAB, Technology Committee, 1979-81 Former SAB Consultant | Member-At-Large |
| 42. Dr. Paul A. Neal<br>President, Chemical Industry Institute of Toxicology<br>Research Triangle Park, NC | FIFRA SAP, 1976-80<br>NDWAC, 1979-82, 1983-85, Former SAB Consultant | Member, Executive Committee |

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| 43. Dr. James V. Neel<br>Lee R. Dice University Professor of Human Genetics<br>University of Michigan Medical School<br>Ann Arbor, Michigan | Former SAB Consultant | Member, Radiation Advisory Committee |
| 44. Dr. Norton Nelson<br>Professor of Environmental Medicine<br>New York University<br>New York, New York | Environmental Health Committee 1975-1979 | Chair, Executive Committee |
| 45. Dr. John M. Neuhold<br>Dept. of Wildlife Sciences<br>College of Natural Resources<br>Utah State University<br>Logan, Utah | Ecology Committee 1974-1978<br>SAB Executive Comm., 1980-1982 | Chair, Subcommittee on Strategic & Long-Term Research Planning |
| 46. Dr. D. Warner North<br>Principal, Decision Focus, Inc.<br>Los Alto, CA | Former SAB Consultant | Member, Environmental Health Committee |
| 47. Dr. Oddvar Nygaard<br>Professor of Radiology<br>Director of the Division of Radiation Biology<br>Case Western Reserve University<br>Cleveland, Ohio | None | Member, Radiation Advisory Committee |
| 48. Dr. Donald J. O'Connor<br>Professor of Environmental Engineering<br>Manhattan College<br>Bronx, NY | None | Member, Environmental Engineering Committee |

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| 49. Dr. Charles R. O'Melia<br>Professor, Dept. of Geography<br>and Environmental Engineering<br>John Hopkins University<br>Baltimore, MD | None | Member, Environmental<br>Engineering Committee |
| 50. Dr. Gilbert S. Omenn<br>Professor and Dean<br>School of Public Health and<br>Community Medicine, SC-30<br>University of Washington<br>Seattle, Washington | Former SAB<br>Consultant | Member, Clean Air<br>Scientific Advisory<br>Committee |
| 51. Dr. Charles F. Reinhardt<br>Haskell Laboratory for Toxicology<br>and Industrial Medicine<br>E. I. du Pont de Nemours & Company<br>Newark, Delaware | None | Member-At-Large |
| 52. Dr. Paul V. Roberts<br>Professor of Environmental<br>Engineering<br>Stanford University<br>Stanford, CA | None | Member, Environmental<br>Engineering Committee |
| 53. Dr. Keith J. Schiager<br>Director, Radiological Health Dept.<br>Orson-Spencer Hall - Rm 100<br>University of Utah<br>Salt Lake City, UT | Former SAB<br>Consultant | Member, Radiation<br>Advisory Committee |
| 54. Dr. William J. Schull<br>Director and Professor of<br>Population Genetics<br>Science Center at Houston<br>Houston, Texas | Member, Environmental<br>Health Committee | Chair, Radiation<br>Advisory Committee |

| CURRENT MEMBERS | FORMER SAB SERVICE | CURRENT POSITION |
|---|---|---|
| 55. Dr. Thomas T. Shen<br>Senior Research Scientist<br>New York State Department of Environmental Conservation<br>Albany, New York | None | Member, Environmental Engineering Committee |
| 56. Dr. Ellen K. Silbergeld<br>Senior Scientist<br>Toxic Chemicals Program<br>Environmental Defense Fund<br>Washington, D.C. | None | Member, Executive Committee |
| 57. Dr. Warren Sinclair<br>President, National Council on Radiation Protection and Measurements<br>Bethesda, Maryland | None | Member, Radiation Advisory Committee |
| 58. Dr. Mitchell Small<br>Assistant Professor<br>Department of Civil Engineering<br>Carnegie-Mellon University<br>Schenley Park<br>Pittsburgh, PA 15213 | Former SAB Consultant | Member, Environmental Engineering Committee |
| 59. Mr. Stephen Smallwood<br>Air Pollution Control Program Mgr.<br>Bureau of Air Quality Management<br>Florida Department of Environmental Regulation<br>Tallahassee, Florida | None | Member-At-Large |
| 60. Jan A. J. Stolwijk<br>Department of Epidemiology and Public Health<br>Yale University School of Medicine<br>New Haven, Connecticut | None | Chair, Indoor Air Research Review Subcommittee |

| CURRENT MEMBER | FORMER SAB SERVICE | CURRENT POSITION |
|---|---|---|
| 61. Dr. Charles Susskind<br>Professor, Electrical<br>Engineering and Computer<br>Sciences Department<br>University of California<br>at Berkeley<br>Berkeley, CA | None | Member, Radiation<br>Advisory Committee |
| 62. Dr. Robert Tardiff<br>Environ-Corporation<br>Washington, D.C. | None | Member, Environmental<br>Health Committee |
| 63. Dr. John Till<br>Private Consultant<br>Neeses, South Carolina | None | Member, Radiation<br>Advisory Committee |
| 64. Dr. Mark J. Utell<br>Associate Professor<br>Department of Medicine<br>University of Rochester<br>School of Medicine<br>Rochester, NY | Former SAB<br>Consultant | Member-At-Large |
| 65. Dr. Herb Ward<br>Department of Biology<br>Department of Environmental<br>Science & Engineering<br>Rice University<br>Houston, Texas | None | Member, Environmental<br>Engineering Committee |
| 66. Dr. James Ware<br>Department of Biostatistics<br>Harvard School of Public Health<br>Boston, Massachusetts | Former CASAC<br>Consultant | Member, Clean Air<br>Scientific Advisory<br>Committee |

| CURRENT MEMBERS | FORMER SAB SERVICE | CURRENT POSITION |
|---|---|---|
| 67. Dr. Bernard Weiss<br>Professor, Division of Toxicology<br>University of Rochester<br>Rochester, New York | Former SAB Consultant | Member, Environmental Health Committee |
| 68. Dr. Jerome J. Wesolowski<br>Air and Industrial Hygiene Lab<br>University of California, Berkeley<br>Berkeley, California | None | Member, Clean Air Scientific Advisory Committee |
| 69. Dr. James Whittenberger<br>Southern Occupational Health Center<br>University of California<br>Irvine, CA | Environmental Health Committee | Member-At-Large<br>Long-term Research Planning Subcommittee |
| 70. Dr. G. Bruce Wiersma<br>Manager, Earth and Life Sciences<br>EG&G Idaho Inc.<br>Idaho Falls, Idaho | Former SAB Consultant | Member, Environmental Effects, Tranport & Fate Committee |
| 71. Dr. Ronald E. Wyzga<br>Program Manager<br>Electric Power Research Institute<br>Palo Alto, CA | Former SAB Consultant | Member, Environmental Health Committee |

## SCIENCE ADVISORY BOARD CONSULTANTS

| | NAME | COMMITTEE/SUBCOMMITTEE |
|---|---|---|
| 1 | Barry J. Adams | Environmental Engineering Committee |
| 2 | Ira Adelman | Ecological Risk Assessment |
| 3 | Eleanor R. Adair | Radiation Advisory Committee |
| 4 | Abdul K. Ahmed | Environmental Health Committee |
| 5 | Ahmed E. Ahmed | Environmental Health Committee |
| 6 | Mary O. Amdur | Clean Air Scientific Advisory Committee |
| 7 | Julian B. Andelman | Environmental Health Committee |
| 8 | Anders W. Andren | National Dioxin Review Subcommittee |
| 9 | Larry Andrews | Environmental Health Committee |
| 10 | Carol R. Angle | Clean Air Scientific Advisory Committee |
| 11 | Lynn Anspaugh | Radiation Advisory Committee |
| 12 | Bernard D. Astill | Environmental Health Committee |
| 13 | Stephen M. Ayres | Clean Air Scientific Advisory Committee |
| 14 | Robert Baboian | Clean Air Scientific Advisory Comm. |
| 15 | Richard E. Balzhiser | National Acid Precipation Advisory Program |
| 16 | Michael J. Barcelona | Environmental Engineering Committee |
| 17 | Charles E. Becker | Environmental Health Committee |
| 18 | Alfred M. Beeton | Laboratory Organization Review Group |
| 19 | Eugene Bentley | Laboratory Organization Review Group |
| 20 | Irwin Billick | Indoor Air Quality Review |
| 21 | Eula Bingham | Air Toxics Study Group |
| 22 | Jeffery Black | Environmental Effects, Transport & Fate Committee |

| | NAME | COMMITTEE/SUBCOMMITTEE |
|---|---|---|
| 23 | James Bond | Environmental Health Committee |
| 24 | Victor Bond | Radiation Advisory Committee |
| 25 | Phillippe Bourdeau | Long Range Ecological Research Subcommittee |
| 26 | Eileen Brennan | Clean Air Scientific Advisory Committee |
| 27 | Kenneth Brown | Environmental Health Committee |
| 28 | Stephen Brown | Radiation Advisory Committee |
| 29 | Gordon Brownell | Radiation Advisory Committee |
| 30 | George T. Bryan | Environmental Health Committee |
| 31 | Thomas A. Burke | Radiation Advisory Committee |
| 32 | Shepard Burton | Environmental Health Committee |
| 33 | Janis Butler | Ground Water Research Review Committee |
| 34 | Martyn M. Caldwell | Stratospheric Ozone Subc. |
| 35 | John Cairns | Environmental Effects Transport & Fate Committee |
| 36 | Clayton Callis | Executive Committee |
| 37 | Larry W. Cantor | Environmental Engineering Committee |
| 38 | Italo Carcich | Environmental Effects, Transport & Fate Committee |
| 39 | George F. Carpenter | Radiation Advisory Committee |
| 40 | Melbourne R. Carriker | Environmental Effects, Transport & Fate Committee |
| 41 | Barbara K. Chang | Environmental Effects, Transport & Fate Committee |
| 42 | Julian Chisolm | Clean Air Scientific Advisory Committee |
| 43 | Leo Chylack | Stratospheric Ozone Subcommittee |

| | NAME | COMMITTEE/SUBCOMMITTEE |
|---|---|---|
| 44 | Thomas Clarkson | Environmental Health Committee |
| 45 | Stephen F. Cleary | Radiation Advisory Committee |
| 46 | Lenore Clesceri | Environmental Effects, Tranport & Fate Committee |
| 47 | Ronald Coburn | Clean Air Scientific Advisory Comm. |
| 48 | Warren D. Cole | Forest Effect Research Review Panel |
| 49 | Rita Colwell | Biotechnology Research Review Group |
| 50 | William E. Cooper | Environmental Effects, Transport & Fate Committee |
| 51 | Herbert H. Cornish | Integrated Environmental Mgmt. |
| 52 | Edward D. Crandall | Clean Air Scientific Advisory Committee |
| 53 | James D. Crapo | Clean Air Scientific Advisory Committee |
| 54 | Kenny S. Crump | Environmental Health Committee |
| 55 | Anita Curran | Clean Air. Scientific Advisory Committee |
| 56 | Allen Cywin | Environmental Engineering Committee |
| 57 | Walter F. Dabberdt | Clean Air Scientific Advisory Committee |
| 58 | Rose Dagirmanjian | Environmental Health Committee |
| 59 | Juan M. Daisey | Radiation Advisory Committee |
| 60 | James M. Davidson | Ground Water Research Review Committee |
| 61 | Terry Davies | Integrated Environmental Management |
| 62 | Stanley N. Davis | Environmental Engineering Committee |
| 63 | Gary L. Diamond | Environmental Health Committee |

| | NAME | COMMITTEE/SUBCOMMITTEE |
|---|---|---|
| 64 | Naihua Duan | Clean Air Scientific Advisory Committee |
| 65 | Patrick R. Durkin | Environmental Engineering Committee |
| 66 | Benjamin C. Dysart, III | Environmental Engineering Committee |
| 67 | Lawrence Fechter | Risk Assessment Guidelines Review Group |
| 68 | Thomas Fitzpatrick | Stratopheric Ozone Subc. |
| 69 | Davis L. Ford | Environmental Engineering Committee |
| 70 | James Fox | Environmental Health Committee |
| 71 | James Friend | Stratospheric Ozone Subcommittee |
| 72 | Myrick A. Freeman | Clean Air Scientific Advisory Committee |
| 73 | John S. Fryberger | Environmental Engineering Committee |
| 74 | James N. Galloway | Clean Air Scientific Advisory Committee |
| 75 | Thomas A. Gasiewicz | Dioxin Toxic Equivalency |
| 76 | Mary E. Gaulden | Environmental Health Committee |
| 77 | Walderico Generoso | Environmental Health Committee |
| 78 | Shelby D. Gerking | Environmental Effects, Transport & Fate Committee |
| 79 | James E. Gibson | Laboratory Organization Review Committee |
| 80 | Jerome B. Gilbert | Environmental Health Committee |
| 81 | Bruno Gilletti | Environmental Engineering Committee |
| 82 | Dan Golomb | Visibility Study Group |
| 83 | Michael Gough | Environmental Health Committee |
| 84 | Herschel E. Griffin | Environmental Health Committee |
| 85 | David T. Grimsrud | Indoor Air Air Quality Review |
| 86 | James Gruhl | Integrated Environmental Management |

| | NAME | COMMITTEE/SUBCOMITTEE |
|---|---|---|
| 87 | Arthur W. Guy | Environmental Effects, Transport & Fate Committee |
| 88 | Jack D. Hackney | Clean Air Scientific Advisory Committee |
| 89 | Yacov Haimes | Ecological Risk Assessment |
| 90 | Ronald J. Hall | Clean Air Scientific Advisory Committee |
| 91 | Paul E. Hammond | Clean Air Scientific Advisory Committee |
| 92 | Ralph W. F. Hardy | Biotechnology Research Review |
| 93 | John H . Harley | Radiation Advisory Committee |
| 94 | Allen Hatheway | Environmental Engineering Committee |
| 95 | Paul Hedman | Scientific and Technological Awards Subcommittee |
| 96 | Ian T. Higgins | Clean Air Scientific Advisory Committee |
| 97 | John E. Hobbie | Ecological Risk Assessment |
| 98 | Ronald D. Hood | Environmental Health Committee |
| 99 | Roger Hornbrook | Environmental Health Committee |
| 100 | Charles Hosler | Environmental Effects, Transport & Fate Committee |
| 101 | Harry Hovey | Clean Air Scientific Advisory Comm. |
| 102 | Lloyd G. Humphreys | Clean Air Scientific Advisory Comm. |
| 103 | Donald M. Hunten | Stratospheric Ozone Subcommittee |
| 104 | Rudolph Husar | Visibility Study Group |
| 105 | Jay S. Jacobson | Clean Air Scientific Advisory Comm. |

| | NAME | COMMITTEE/SUBCOMMITTEE |
|---|---|---|
| 106 | Ronald L. Jarman | Environmental Effects, Transport & Fate Committee |
| 107 | Alfred Joensen | Environmental Effects, Transport & Fate Committee |
| 108 | James Johnson | Environmental Health Committee |
| 109 | David Kaufman | Environmental Health Committee |
| 110 | Graham Kalton | Radiation Advisory Committee |
| 111 | Stephen V. Kaye | Radiation Advisory Committee |
| 112 | Lawrence Keith | Environmental Engineering Committee |
| 113 | Laurence S. Kaminsky | Environmental Health Committee |
| 114 | Curtis D. Klaassen | Environmental Health Committee |
| 115 | Raymond K. Klicius | Environmental Effects, Transport & Fate Committee |
| 116 | Jane Q. Koenig | Clean Air Scientific Advisory Committee |
| 117 | Joseph Koonce | Strategic and Long Term Research Planning Subcommittee |
| 118 | Paul Kotin | Clean Air Scientific Advisory Committee |
| 119 | Thomas J. Kulle | Indoor Air Quality Review |
| 120 | Marvin Kuschner | Environmental Health Committee |
| 121 | Victor G. Laties | Clean Air Scientific Advisory Committee |
| 122 | Lester B. Lave | Stratospheric Ozone Subcommittee |
| 123 | Brian B. Leaderer | Clean Air Scientific Advisory Committee |
| 124 | Michael Lebowitz | Clean Air Scientific Advisory Committee |

| | NAME | COMMITTEE/SUBCOMMITTEE |
|---|---|---|
| 125 | Jay H. Lehr | Ground Water Research Review Comm. |
| 126 | Allan H. Legge | Clean Air Scientific Advisory Comm. |
| 127 | Steven Lewis | Environmental Health Committee |
| 128 | Paul J. Lioy | Integrated Environmental Management |
| 129 | Lawrence D. Longo | Clean Air Scientific Advisory Committee |
| 130 | Leonard A. Losciuto | Radiation Advisory Committee |
| 131 | Cecil Lue-Hing | Environmental Engineering Committee |
| 132 | Richard Luthy | Environmental Engineering Committee |
| 133 | Delbert C. McCune | Clean Air Scientific Advisory Committee |
| 134 | J. Corbett McDonald | Environmental Health Committee |
| 135 | Donald McKay | Ecological Risk Assessment |
| 136 | Donald E. McMillan | Environmental Health Committee |
| 137 | Peter McMurry | Environmental Effects, Transport & Fate Committee |
| 138 | Wilbur McNulty | Environmental Effects, Transport & Fate Committee |
| 139 | Wesley A. Magat | Clean Air Scientific Advisory Comm. |
| 140 | Peter N. Magee | Environmental Health Committee |
| 141 | Kathern Mahaffey | Clean Air Scientific Advisory Committee |
| 142 | David Maschwitz | Environmental Effects Transport & Fate Committee |
| 143 | Myron Mehlman | Environmental Health Committee |
| 144 | Daniel Menzel | Environmental Health Committee |
| 145 | James Mercer | Ground Water Research Review Committee |
| 146 | Jacqueline Michel | Radiation Advisory Committee |

| | NAME | COMMITTEE/SUBCOMMITTEE |
|---|---|---|
| 147 | David W. Miller | Ground Water Research Review Committee |
| 148 | Irving Mintzer | Stratospheric Ozone Subcommittee |
| 149 | Harold Mooney | Long-range Ecological Research Needs Subcommittee |
| 150 | Granger W. Morgan | Clean Air Scientific Advisory Committee |
| 151 | Richard H. Moser | Environmental Health Committee |
| 152 | Brooke T. Mossman | Environmental Health Committee |
| 153 | James W. Moulder | Biotechnology Research Review Group |
| 154 | Bruce Napier | Radiation Advisory Committee |
| 155 | Scott W. Nixon | Environmental Effects, Transport & Fate Committee |
| 156 | Roger G. Noll | Clean Air Scientific Advisory Committee |
| 157 | Guenter Oberdoerster | Environmental Health Committee |
| 158 | Allan OKey | Integrated Environmental Management |
| 159 | Patrick O'Keefe | National Dioxin Review |
| 160 | Betty H. Olsen | Environmental Health Committee |
| 161 | Michael Oppenheimer | National Acid Precipitation Advisory Program |
| 162 | Gordon H. Orians | Environmental Effects, Transport & Fate Committee |
| 163 | Michael Overcash | Environmental Engineering Committee |
| 164 | Haluk Ozkaynuk | Visibility Study Group |
| 165 | Albert L. Page | Environmental Engineering Committee |
| 166 | Bernard C. Patten | Environmental Effects, Transport & Fate Committee |
| 167 | Stanford S. Penner | National Acid Precipitation Advisory Program |

| | NAME | COMMITTEE/SUBCOMMITTEE |
|---|---|---|
| 168 | Frederica Perera | Environmental Health Committee |
| 169 | Tony J. Peterle | Environmental Effects, Transport & Fate Committee |
| 170 | Richard Peterson | National Dioxin Review |
| 171 | James Petty | National Dioxin Review |
| 172 | Henry Pitot | Risk Assessment Review Group |
| 173 | Gabriel L. Plaa | Environmental Health Committee |
| 174 | Jeanne Poindexter | Biotechnology Research Review Subc. |
| 175 | Lincoln Pollissar | Environmental Health Committee |
| 176 | Thomas A. Prickett | Ground Water Research Review Committee |
| 177 | John Quarles | Environmental Engineering Comm. |
| 178 | Michael B. Rabinowitz | Clean Air Scientific Adv. Comm. |
| 179 | Martha J. Radike | Environmental Health Committee |
| 180 | Stephen M. Rappaport | Environmental Health Committee |
| 181 | Verne A. Ray | Environmental Health Committee |
| 182 | Paul Risser | Ecological Risk Assessment |
| 183 | Joseph V. Rodricks | Radiation Advisory Committee |
| 184 | Joan Rose | Environmental Health Committee |
| 185 | Robert Rowe | Clean Air Scientific Advisory Committee |
| 186 | Richard Royall | Clean Air Scientific Advisory Committee |
| 187 | Karl K. Rozman | Environmental Health Committee |
| 188 | Liane Russell | Environmental Health Committee |
| 189 | Stephen N. Safe | Environmental Health Committee |
| 190 | Jonathan Samet | Radiation Advisory Committee |
| 191 | Adel F. Sarofim | Environmental Effects, Transport & Fate Committee |

| | NAME | COMMITTEE/SUBCOMMITTEE |
|---|---|---|
| 192 | Harold Schecter | Environmental Health Committee |
| 193 | Marc A. Schenker | Clean Air Scientific Advisory Committee |
| 194 | Richard Schlesinger | Environmental Health Committee |
| 195 | Dennis Schuetzle | Radiation Advisory Committee |
| 196 | Donald F. Schutz | Radiation Advisory Committee |
| 197 | Richard Sextro | Radiation Advisory Committee |
| 198 | Eileen M. Shanbrom | Environmental Health Committee |
| 199 | Jack Shannon | Visibility Review Group |
| 200 | Herman H. Shugart | Forest Effects Research Review Panel |
| 201 | Carl A. Silver | Environmental Engineering Committee |
| 202 | Clifford V. Smith | Radiation Advisory Committee |
| 203 | Kerry V. Smith | Clean Air Scientific Advisory Committee |
| 204 | Roger P. Smith | Environmental Health Committee |
| 205 | Michael D. Smolen | Environmental Effects, Transport & Fate Committee |
| 206 | Mark D. Sobsey | Environmental Health Committee |
| 207 | Frank Speizer | Clean Air Scientifc Advisory Comm. |
| 208 | Peter Spencer | Environmental Health Committee |
| 209 | John Spengler | Clean Air Scientific Advisory Comm. |
| 210 | Robert A. Squire | Environmental Health Committee |
| 211 | Thomas B. Starr | Environmental Health Committee |
| 212 | Andrew F. Stehney | Radiation Advisory Committee |
| 213 | Joseph Stetter | Total Human Exposure Subcommittee |
| 214 | Roger Strelow | Research Strategies Subcommittee |
| 215 | Peter W. Summers | Forest Effects Review Review Panel |

| | NAME | COMMITTEE/SUBCOMMITTEE |
|---|---|---|
| 216 | Frederick W. Sunderman | Environmental Health Committee |
| 217 | James A. Swenberg | Environmental Health Committee |
| 218 | Nien Dak Sze | Stratospheric Ozone Subcommittee |
| 219 | Joel Tarr | Integrated Environmental Management |
| 220 | George E. Taylor | Clean Air Scientific Advisory Committee |
| 221 | Thomas Tephly | Environmental Health Committee |
| 222 | Lloyd B. Tepper | Environmental Health Committee |
| 223 | Ducan C. Thomas | Radiation Advisory Committee |
| 224 | Michael Treshow | Clean Air Scientific Advisory Committee |
| 225 | John Trijonis | Visibility Review Group |
| 226 | William A. Turner | Radiation Advisory Committee |
| 227 | Ruby M. Valencia | Environmental Health Committee |
| 228 | Charles Velzy | Environmental Effects, Transport & Fate Committee |
| 229 | W. Kip Viscusi | Clean Air Scientific Advisory Committee |
| 230 | Evan Vlachos | Environmental Engineering Committee |
| 231 | William Waller | Environmental Effects, Transport & Fate Committee |
| 232 | Leonard Weinstein | Environmental Effects, Transport & Fate Committee |

ANNEX A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

ADVISORY COMMITTEE CHARTER

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ORGANIZATION AND FUNCTIONS - COMMITTEES, BOARDS, PANELS, AND COUNCILS

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## SCIENCE ADVISORY BOARD

1. PURPOSE AND AUTHORITY. This Charter is reissued for the Science Advisory Board in accordance with the requirements of the Federal Advisory Committee Act, 5 U.S.C. (App.I) 9(c). The former Science Advisory Board, administratively established by the Administrator of EPA on January 11, 1974, was terminated in 1978 when the Congress created the statutorily mandated Science Advisory Board by the Environmental Research, Development, and Demonstration Authorization Act (ERDDAA) of 1978, 42 U.S.C. 4365. The Science Advisory Board charter was renewed October 31, 1979; November 19, 1981; November 3, 1983; and October 25, 1985.

2. SCOPE OF ACTIVITY. The activities of the Board will include analyzing problems, conducting meetings, presenting findings, making recommendations, and other activities necessary for the attainment of the Board's objectives. Ad hoc panels may be established to carry out these special activities in which consultants of special expertise may be used who are not members of the Board.

3. OBJECTIVES AND RESPONSIBILITIES. The objective of the Board is to provide advice to EPA's Administrator on the scientific and technical aspects of environmental problems and issues. While the Board reports to the Administrator, it may also be requested to provide advice to the U.S. Senate Committee on Environment and Public Works or the U.S. House Committees on Science and Technology, Energy and Commerce, or Public Works and Transportation. The Board will review scientific issues, provide independent advice on EPA's major programs, and perform special assignments as requested by Agency officials and as required by the Environmental Research, Development, and Demonstration Authorization Act of 1978 and the Clean Air Act Amendments of 1977. Responsibilities include the following:

- Reviewing and advising on the adequacy and scientific basis of any proposed criteria document, standard, limitation, or regulation under the Clean Air Act, the Federal Water Pollution Control Act, the Resource Conservation and Recovery Act of 1976, the Noise Control Act, the Toxic Substances Control Act, the Safe Drinking Water Act, the Comprehensive Environmental Response, Compensation, and Liability Act, or any other authority of the Administrator;

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- Reviewing and advising on the scientific and technical adequacy of Agency programs, guidelines, methodologies, protocols, and tests;

- Recommending, as appropriate, new or revised scientific criteria or standards for protection of human health and the environment;

- Through the Clean Air Scientific Advisory Committee, providing the scientific review and advice required under the Clean Air Act, as amended;

- Reviewing and advising on new information needs and the quality of Agency plans and programs for research, and the five-year plan for environmental research, development and demonstration.

- Advising on the relative importance of various natural and anthropogenic pollution sources;

- As appropriate, consulting and coordinating with the Scientific Advisory Panel established by the Administrator pursuant to section 21(b) of the Federal Insecticide, Fungicide and Rodenticide Act, as amended; and

- Consulting and coordinating with other Agency advisory groups, as requested by the Administrator.

4. COMPOSITION. The Board will consist of a body of independent scientists and engineers of sufficient size and diversity to provide the range of expertise required to assess the scientific and technical aspects of environmental issues. The Board will be organized into an executive committee and several specialized committees, all members of which shall be drawn from the Board.

The Board is authorized to constitute such specialized standing member committees and ad hoc investigative panels and subcommittees as the Administrator and the Board find necessary to carry out its responsibilities. The Administrator will review the need for such specialized committees and investigative panels at least once a year to decide which should be continued. These committees and panels will report through the Executive Committee.

The Deputy Administrator also shall appoint a Clean Air Scientific Advisory Committee of the Board to provide the scientific review and advice required by the Clean Air Act Amendments of 1977. This Committee, established by a separate charter, will be an integral part of the Board, and its members will also be members of the Science Advisory Board.

ADVISORY COMMITTEE CHARTER

5. MEMBERSHIP AND MEETINGS. The Deputy Administrator appoints individuals to serve on the Science Advisory Board for staggered terms of one to four years and appoints from the membership a Chair of the Board. The Chair of the Board serves as Chair of the Executive Committee. Chairs of standing committees or ad hoc specialized subcommittees serve as members of the Executive Committee during the life of the specialized subcommittee. Each member of the Board shall be qualified by education, training, and experience to evaluate scientific and technical information on matters referred to the Board. No member of the Board shall be a full-time employee of the Federal Government.

There will be approximately 60-75 meetings of the specialized committees per year. A full-time salaried officer or employee of the Agency will be present at all meetings and is authorized to adjourn any such meeting whenever this official determines it to be in the public interest.

Support for the Board's activities will be provided by the Office of the Administrator, EPA. The estimated annual operating cost will be approximately $1,416,700 and 14.6 work years to carry out Federal permanent staff support duties and related assignments.

6. DURATION. The Board shall be needed on a continuing basis. This charter will be effective until November 8, 1989, at which time the Board charter may be renewed for another two-year period.

7. SUPERSESSION. The former charter for the Science Advisory Board, signed by the Administrator on October 2, 1985, is hereby superseded.

11/2/87
Approval Date

A. James Barnes
Deputy Administrator

NOV - 6 1987
Date Filed with Congress